

## MODULAR ELECTROMECHANICAL DEVICE

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to and the benefit of U.S. Provisional Patent Application No. 62/281,158 filed on Jan. 20, 2016, which is incorporated by reference in its entirety.

### TECHNICAL FIELD

[0002] The embodiments described herein relate to modular electromechanical devices, more specifically to electromechanical devices having their functions defined by the combination of modules attached to a chassis.

### BACKGROUND

[0003] Conventional consumer electronics have a short life cycle. Consumers purchase consumer electronics that utilize cutting edge technology only to find that their electronics are outdated in the near future. The consumer electronics are then thrown away and replaced with the latest version of the electronics and the life cycle of the electronics repeats.

[0004] Typically, the hardware components included in the consumer electronics that are considered “outdated” are still useable. However, the hardware components can no longer be re-used since consumer electronics are designed as closed systems. From a consumer prospective, the life cycle of conventional consumer electronics is expensive and wasteful.

### SUMMARY

[0005] The embodiments herein describe a modular electromechanical device. The modular electromechanical device includes a chassis and a plurality of functional modules that can be connected to the chassis. Each module is associated with a different functionality. The functionality of the modular electromechanical device is defined based on the functionality of the different functional modules that are connected to the electromechanical device. Thus, a user can change the functionality of the modular electromechanical device based upon which functional modules the user chooses to connect to the chassis.

[0006] In one embodiment an electromechanical device comprises: a processor module comprising: a processor circuit, a memory circuit connected to the processor circuit, and an interfacing circuit connected to the processor circuit. The electromechanical device also comprises a chassis including: a first attachment structure configured to attach the processor module to the chassis, one or more second attachment structures, each of the one or more second attachment structures configured to attach one of a plurality of functional modules to the chassis, each of the plurality of functional modules associated with a discrete functionality, and a plurality of traces extending between the first attachment structure and the one or more second attachment structures to operatively connect the interfacing circuit of the processor module with one or more functional modules attached to the one or more second attachment structures, wherein a function to be performed by the electromechanical device defined by at least one or more functional modules attached to the one or more second attachment structures.

[0007] In one embodiment, the chassis is a unitary structure formed from a three-dimensional (3D) printing process to include the first attachment structure, the one or more second attachment structures, and the plurality of traces.

[0008] In one embodiment, the first attachment structure is a first cavity extending into a body of the chassis and having at least a subset of the plurality of traces exposed from a wall defining the first cavity, and each of the one or more second attachment structures is a second cavity having at least a subset of the plurality of traces extending into the body of the chassis and having at least a subset of the plurality of traces exposed from a wall defining the second cavity.

[0009] In one embodiment, at least a subset of second cavities have a same size and shape.

[0010] In one embodiment, at least two of the one or more second attachment structures are sized and shaped differently to attach one group of functional modules but not another group of functional modules.

[0011] In one embodiment, each of the one or more second attachment structures includes an alignment structure to secure a corresponding functional module.

[0012] In one embodiment, the plurality of functional modules comprise at least one of a speaker functional module, a microphone functional module, a touch pad functional module, a global positioning system (GPS) functional module, a display screen functional module, or a thermometer functional module.

[0013] In one embodiment, the processor module is configured to determine the function to be performed by the electromechanical device by identifying functions performed by the functional modules attached to the chassis.

[0014] In one embodiment, the processor module is configured to determine the function to be performed by the electromechanical device based further on an impedance of an interfacing connection of a functional module attached to the chassis.

[0015] In one embodiment, the processor module further determines the function to be performed by the electromechanical device based on a sequence in which the one or more functional modules are attached to the chassis.

[0016] In one embodiment, the processor module further determines the function to be performed by the electromechanical device based on which of the one or more second attachment structures are used to attach the one or more functional modules.

[0017] In one embodiment, the electromechanical device performs a first function responsive to attaching a functional module to one of the second attachment structures, and the electromechanical device performs a second function responsive to attaching the same functional module to another of the second attachment structures.

[0018] In one embodiment, the processor module further determines the function to be performed by the electromechanical device based on a pattern formed by the plurality of traces in the chassis.

[0019] In one embodiment, the processor module determines that a first function is to be performed by the electromechanical device responsive to a set of functional modules connected through the plurality of trace wires of a first pattern, and wherein the processor module determines that a second function is to be performed by the electromechanical device responsive to the same set of functional modules connected through the plurality of trace wires of a second pattern.